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## FOREIGN TECHNOLOGY DIVISION



SUMMARY OF ACHIEVEMENTS IN SCIENTIFIC RESEARCH



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## HUMAN TRANSLATION

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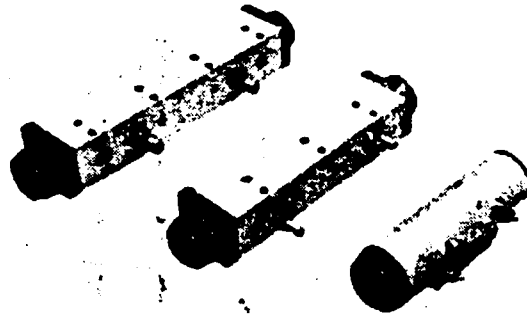


## Summary of Achievements in Scientific Research

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P.O. Box 648  
1985 Printed.

HDD Series, Single Lamp, Single Order Ruby Laser



### Usages:

This series has five types including DD-06, 08, 10, 12 and 16. They can be applied in the field of medical treatment, spectral analysis, high speed photography, hole punching, welding, crop breeding, thermal processing, semiconductor technology, biophotochemical research and scientific experiments, etc..

Performance and technical index:

Recurrence frequency: 0.1 Hz;	Output energy stability: 5%;
Divergent angle < 10 mrad;	Static output energy 2 ~ 30J;
Dynamic energy: 0.3 ~ 2.5J;	Dynamic pulse width: 20 ~ 40ns;
Peak Power: 7.5 ~ 75 MW.	

HSD Series, Single Order, Dual Lamp Ruby Laser

Usages:

This series has four types includeing HSD-06, 08, 10 and 12. They can be applied in pulse holography and the fields which require concentrated facula, symmetry and good mode.

Performance and technical index:

Output energy: Static 2.5 ~ 15J;	Dynamic 0.3 ~ 1.5J;
Pulse width: Static 0.5 ~ 1ms;	Dynamic 20 ~ 40ns;
Divergent angle: 8 ~ 10mrad;	Stability 5%.

HDZ Series, Recurrence Rate Ruby Laser

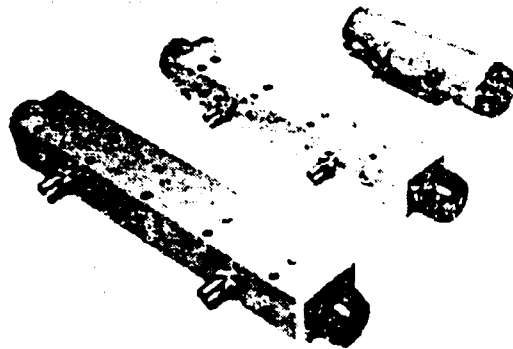
This series consists of two types: HDZ-10 and 12. They can be applied in the field of smear photography, range finding, lighting

of satellites and warheads. They can also be used in the aspects of teaching and scientific research, etc..

Performance and technical index:

Output wave length: 0.694 $\mu$ m;	Recurrence frequency 1Hz;
Output energy: Static 4 ~ 6J;	Dynamic 0.5 ~ 0.75J;
Pulse width: 20 ~ 40ns;	Peak power: 12 ~ 31MW;
Divergent angle < 10mrad;	
Energy stability: Single order 5%; Recurrence rate 8%.	

NDD Series, Single Lamp, Single Order Neodymium Glass Laser



Usages:

This series has five types including NDD-06, 08, 10, 12 and 16. They can be applied in medical treatment, spectral analysis, hole punching, welding, crop breeding, thermal treatment, semiconductor technology, biophotochemical research as well as teaching and scientific experiments, etc.

Performance and technical index:

Output wave length: 1.06 $\mu$ m;

Output energy stability 5%;

Divergent angle: 3 ~ 5 mrad;

Output static energy 4~60J;

Pulse width: 0.5 ~ 1ms;

Recurrence frequency 0.1Hz.

NDZ Series Recurrence Rate Neodymium Glass Laser

Usages:

This series includes six types: NDZ-06, 08, 10, 12, 16 and 20. They are mainly used in various industry production fields, such as hole punching, welding and so forth. They can also be used in teaching and scientific research.

Performance and technical index:

Output static energy: 3.5 ~ 60J;

Pulse width 0.5 ~ 1ms;

Recurrence frequency 0.4 ~ 1 Hz;

Energy stability, single order 5%;

Beam divergent angle 3 ~ 5 mrad;

Recurrence rate 8%.

## LQY-1 Acoustic-Photo modulated YAG Laser

### Usages:

This type of laser can be used in electric resistance fine tuning, sheet product cutting, grooving as well as marking on various material and medical treatment, etc..

### Performance and technical index:

Continuous power: 5 ~ 80W;

Peak power: 10 ~ 30kW;

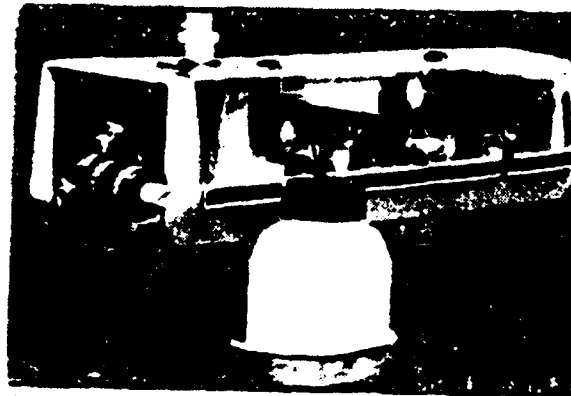
Recurrence frequency 1 ~ 40kHz;

Output wavelength: 1.06 $\mu$ m;

Beam diameter  $\phi$ 2 ~ 5mm;

Peak output stability <10%.

## JAZL-1 Cancer Diagnosis and Treatment Laser



### Usages:

This machine can be used in helping early cancer diagnosis and



## YJG-1 Laser Sensitivity Detector for Chemical Agent

### Usages:

This device can be used for light sensitivity quantitative determination for dynamite, detonators or other chemical agents. It can perform in-situ energy level inspections. Its precision is also high.

### Performance and technical index:

Wavelength 1.06  $\mu\text{m}$ ;

Energy 0.1 ~ 25J;

Precision  $\pm 2.5\%$ ;

Pulse width 200 ~ 650  $\mu\text{s}$ .

## JGS-1 Type Laser Scan Radius Gauge

### Usages:

This gauge can be used to determine various transparent or opaque pipes used in control systems. An error voltage signal can also be output for automatic control use.

### Performance and technical index:

Noncontact dynamic measurement: Temperature of determined tube is 1400 °C ~ 1700 °C; Measurement range  $\phi 3 \sim \phi 100\text{mm}$ ; The precision

is better than the standard issued by the Light Industry  
Department; Digital output.

### Laser Atomized Particle Microphotography System

#### Usages:

This system is an on-spot high resolution photography which  
can be used in studying engine fuel atomizing, coal powder, water  
gas atomizing, particle corrosion model of wind tunnel, explosion  
and other instantaneous change scenes.

#### Performance and technical index:

Object view 5x7 ~ 27x37 mm;

Object range >300mm;

Camera magnifying power 3 ~ 15 times;

Resolution 5m;

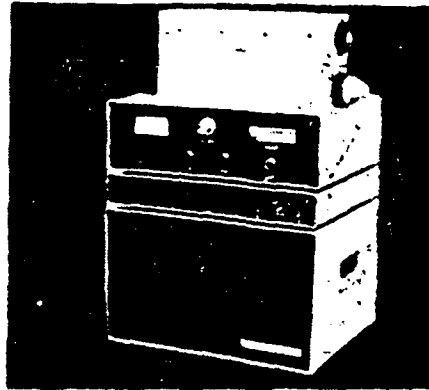
Laser pulse width <100ns;

Pulse number 1 ~ 9;

Pulse energy  $E_t > 1.5J$ ;

Pulse interval 20 ~ 400 ~~ms~~.

## XJSY-I Series Pulse Photographic Light Unit



### Usages:

This unit can be used to conduct multiple-pulse exposure for a high speed flight object or particles as well as to perform the schlieren photography for a shock wave. It is a very powerful tool for high speed motion research.

### Performance and technical index:

Output energy  $E_t > 1.5J$ ;                      Pulse width  $< 100ns$ ;  
Peak power: Single pulse output  $E_s > 40MW$ ; Series pulses output,  
pulse energy is not less than  $8MW$  for the first 5 pulses.  
The entire set is appropriate for outdoor work.

## HHF-1 Type High Speed Photographic Flash

### Usages:

It is a high speed photographic light source for shooting various instantaneously changing processes and a shock wave field.

### Performance and technical index:

Flash duration  $< 0.5 \mu s$ ;

Flash frequency:  $2 \sim 100 \text{ Hz}$ .

## TC Series Flight Object Capture

### Usages:

It is used to perform noncontact detection and measurement for a high speed flight object. It can not only capture the target, but also determine the target velocity and the decay coefficient.

### Performance and technical index:

Flight velocity  $1 \sim 7 \text{ km/s}$ ;

Response time  $< 50 \text{ ns}$ ;

Flight object dimension  $\leq \phi 6 \text{ mm}$ .

## WJJ-55A Automatic Controlled Motor Energy Saver

### Usages:

This device is a self-adjusting, automatic controlled energy saver by using a single microprocessor board. It is suitable for a three-phase squirrel-cage motor whose power is under 55kw. This device is especially good for situations of light loading, load varying and frequent starting.

### Performance and technical index:

Electrified wire netting voltage  $380 \pm 10\%$  V; Electrified wire netting frequency 50 Hz; Electricity saving rate is 10 ~ 30% in power phase, 20 ~ 40% in non-power phase. It contains 16 stages of soft starting functions which can substitute for the starter. It also has an out-of-phase protection function.

## JQR2-4 Type Wavelength Scanner Controller

### Performance and technical index:

Bidirectional wavelength scan, precision  $\pm 0.01\text{nm}$ ;

Six scanning speeds;

Five-digit wavelength display, precision  $\pm 0.01\text{nm}$ ;

Indicator precision  $\pm 0.01\text{nm}$ ;

It has an automatic reboot function;

It can carry a three-phase step motor whose current is less than 4A.

#### CH-I Punching Machine Working Position Numerical Controller

##### Usages:

During a new product development in machinery manufacture or during a small lot trial production, a single punch can be used to substitute a punch core plate for the composite mould. This can reduce the research period and save expense.

##### Performance and technical index:

Z-80 single board processor;

The step number of the step motor and punching number can be displayed in a 5-digit decimal. Rotation rate 0.01 ~ 10 cycle/sec;

Allowable punching time: 0.1 second ~ 20 seconds; Step pitch angle  $0.375^{\circ}/\text{step}$ ; Ten compensation intervals and adjustable compensation quantity.

## XFL-1-2 Fine Dividing Circuit Driver of Step Motor

### Usages:

It can be a driver of a terminal executing element for a high precision numerical control device, or be a driver of an executing element of a computer (microprocessor) control device. It is perfect for the industry of producing numerical control instruments and meters or high precision quantity controllers.

### Performance and technical index:

Minimum step pitch resolution: 2 ~ 20 fine intervals;

Error <10%; High efficiency operation, efficiency >70%;

It has high interference resistance, anti-interference >7V;

It is suitable for a three-phase or five-phase step motor with current <6A.

## GFY-1 Laser Light Intensity Distribution Detector

### Usages:

Use to measure the lateral energy distribution for various continuous laser beams, as well as to determine the mode, divergence angle, mode stability, relative power density, diffraction attenuation, mode volume, power stability and etc..

Performance and technical index:

Response time: 1/100 s;

Detection response 380V/W;

Spectrum range: 0.4 ~ 11  $\mu\text{m}$ ;

Energy range: 1mW ~ 50W.

I-1 Integral Type Laser Stability Detector

Usages:

Use to measure the output power stability for a continuous CO laser.

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Performance and technical index:

Wavelength range: 10.6  $\mu\text{m}$ ;

Power range: 1 ~ 1000W;

Spatial homogeneity 3%;

Linearity <1%.

KJN-4 Energy Detector for High Speed Response Laser

Usages:

Use to measure the energy of a high recursive frequency laser and its output power. It can sample records in a high speed, fast and/or low speed displays, perform the mean value and root mean



square error calculations, etc..

Performance and technical index:

Applicable wavelength 1.06 or 0.69  $\mu\text{m}$ ;

Sampling no. 100;

Record speed: 1000 times/second; Maximum scale: 1J;

Linear error: <5%.

JBD-2 Type Laser Wavelength Calibrator

Usages:

This unit uses the Ar and Ne nature spectrum as references to calibrate the wavelength of various pulse-adjustable dye lasers.

Performance and technical index:

Wavelength range: 0.4 ~ 0.75  $\mu\text{m}$ ; Calibration precision: 1pm.

ZQ-200 Type Ultrasonic Modulator

Usages:

A series of 25  $\mu\text{s}$  interval pulse with 200ns pulses width can be

obtained by combining this unit and a pulse laser; a saw tooth modulated output of  $5 \times 10^7$  Hz can be obtained by combining this unit with a continuous laser. It has special application in laser processing technology.

Performance and technical index:

Ultrasonic frequency:  $>20\text{kHz}$ ; Peak interval  $20 \sim 25\mu\text{s}$ ;  
Peak pulse width  $200\text{ ns}$ .

JQ Series Crystal Q Modulating Unit

Usages:

It can produce a dynamic Q modulating large pulse when combined with a solid laser.

Performance and technical index:

Working form: Pressure discharging type;  
Half wave voltage:  $\text{KDP} \sim 5.5\text{kV}$ ,  $\text{KD*P} \sim 3.0\text{kV}$ ;  
Pulse width  $20 \sim 40\text{ns}$ ;  
Breaking threshold  $>100\text{MW/cm}^2$

## RS-1 Type Dye Recirculation System

### Usages:

This unit can provide a stable, high speed dye jet with photography quality for a dye laser when it applies to a modulatory laser which has a continuous wave or a highly recursive frequency pulse.

### Performance and technical index:

This system includes a circulation pump, cooler, filter, liquid container and shell, totalling five sections. Both the pump and piping are made of corrosion-resisting material.

Maximum pressure: 12kg/cm<sup>2</sup>;

Maximum flow rate: 1.5L/min;

Working pressure: 8kg/cm<sup>2</sup>;

Flow rate: 1.25L/min.

## GQO-1, 2 Type Fiber Optic Coupler

### Usages:

It is suitable for laser processing, telecommunication and medical treatment.

Performance and technical index:

Applicable wavelength: visible and near infrared;

Coupling efficiency: 70 ~ 90%.

#### ZZ100 Type Straight Telescope

Usages:

It can be used for various optical element adjusting, especially useful for solid laser resonator adjustment.

Performance and technical index:

Magnification 10 times;

Angular resolution 1';

Dimension 30x50x200mm.

#### KS Series Laser Expanding Beam Telescope

Usages:

It is used as beam expansion for a laser to reduce the angular divergence, or can be installed reversely to increase high power intensity and used as long focus lanes.

Performance and technical index:

Slit dimension  $\phi 5 \sim \phi 12 \text{mm}$ ; Magnification 2 ~ 4 times;  
Applicable wavelength 1.06 or 0.69  $\mu\text{m}$ ;  
Resolution 5" ~ 7.7".

Garnet Crystal Mixed with Neodymium, Yttrium and Aluminum

Dimension  $\phi 4 \sim 8 \times 50 \sim 100 \text{mm}$ ; Crystal direction  $\langle 111 \rangle$ ;  
Neodymium mixing quantity 0.8 ~ 1at%;  
Interference strip  $\langle 1 \text{ strip/inch}$ ;  
Dulling ratio  $\geq 25 \text{db}$ ;  
Parallelism of both ends  $\leq 20''$ ;  
Flatness  $\leq \lambda/4$ ; Perpendicularity  $\langle 3'$ ;  
Smoothness: above grade I;  
Coating: single layer 1.06  $\mu\text{m}$  transparent film.

Holograde Ruby Crystal

Mixed Cr ion concentration 0.03 ~ 0.05at%;  
Crystal direction 60°, 90°;  
Interference strip 0.25 ~ 1.0 strip/inch;  
Dimension:  $\phi 6 \sim 12 \times 80 \sim 130 \text{mm}$ .

## WG-1 Type Micro Optical Apparatus Seat

### Usages:

An optical apparatus seat is the structure system used in the optical experiment, measurement and inspection facility. It is composed of basic structure elements and optical elements. It is very flexible and can be easily integrated into various high quality optical systems as well as various laser applied experiment setups and holographic experiment devices, etc.

### Technical Services

In addition to providing modern technical services to the brother institutes of this institute, such as dynamic holo damage-free inspection, laser spectrum research, laser micro-processing, laser photochemical reaction, laser medical treatment and laser inspection, etc., this institute can also provide the following technical consultation and services.

#### 1. Laser Parameters Determination

This institute is the Beijing Laser Determination Center approved by the National Science Committee and is responsible for the unified determination of external parameters and energy levels for national commonly used gas lasers, solid lasers and dye lasers, etc.

## 2. Laser Dynamic Holo Determination

This institute not only provides laser dynamic holo inspection devices for its brother institutes, but also owns a laser dynamic holo determination lab which is specifically for technology development, providing holographic experiment services for customers and promoting the dynamic holo determination technical services.

## 3. Laser Processing

This institute has a laser micro-processing lab which is equipped with a laser multipurpose processing machine. This machine can conduct various complicated micro-processes, such as punching, welding, sheet metal cutting, etc. when combining with a yttrium glass laser, recursive frequency YAG laser, continuous YAG laser, and adopting the ultrasonic modulation technique, acoustic photo Q modulating technique and simulation technique to achieve an excellent result which is impossible for general laser processing.

## 4. Laser High Speed Photography

This institute has series pulse Q modulating ruby laser systems which consists of four series of products. All can be applied to high speed schlieren photography, projectile

photography, engine fuel atomizing and flow field distribution analyses, etc.. The system has been actually applied in national defense and scientific research. This institute can also work together with customers to conduct high speed photographic experiments.

#### 5. Microprocessor Application

This institute has a microprocessor application lab which exclusively conducts research in the field of energy saving, data processing, image processing, procedure control, instrument and meter used microprocessor, artificial intelligence, fluorescence analysis, machine tool modification and modern administration, etc. New application fields can be developed according to customers' requirements.

#### 6. Film Coating

This institute can provide processing works of various optical thin film elements such as laser reflector, output lens, V shaped high efficient transparent film, various color scan films for a flat color scanning system, neutral spectrosopes of various transmissivity-reflectivity ratios, wideband spectrum calibrator, interferant optical filter and wideband transparent films, etc..



## 7. Optical System Design and Processing

This institute can provide designs and processing for optical elements and optical systems.

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